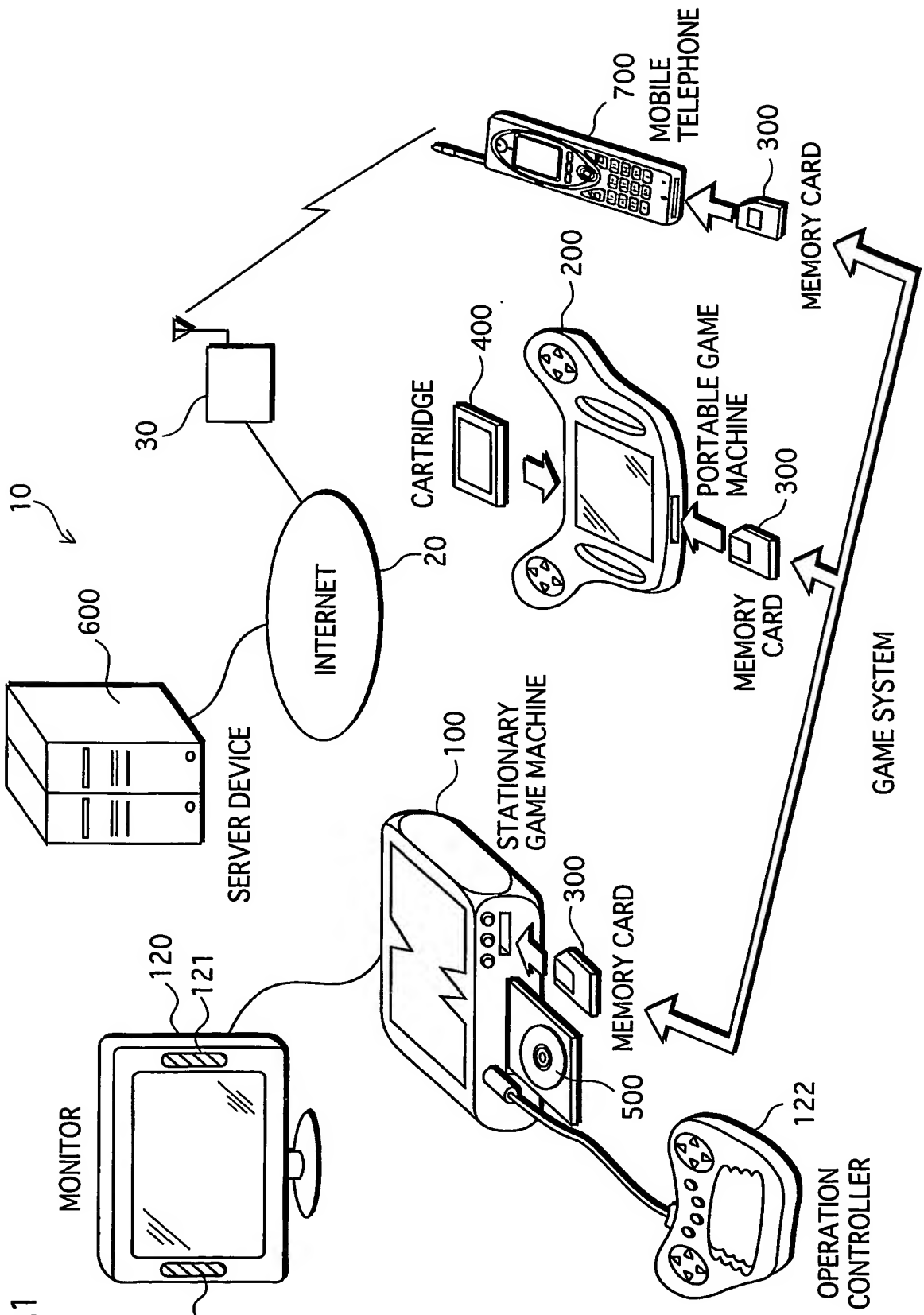

10
600
SERVER DEVICE
INTERNET
20
30
700
MOBILE TELEPHONE
300
MEMORY CARD
200
400
CARTRIDGE
PORTABLE GAME MACHINE
300
MEMORY CARD
GAME SYSTEM
100
STATIONARY GAME MACHINE
300
MEMORY CARD
500
120
121
MONITOR
121
122
OPERATION CONTROLLER

FIG.1

FIG.2

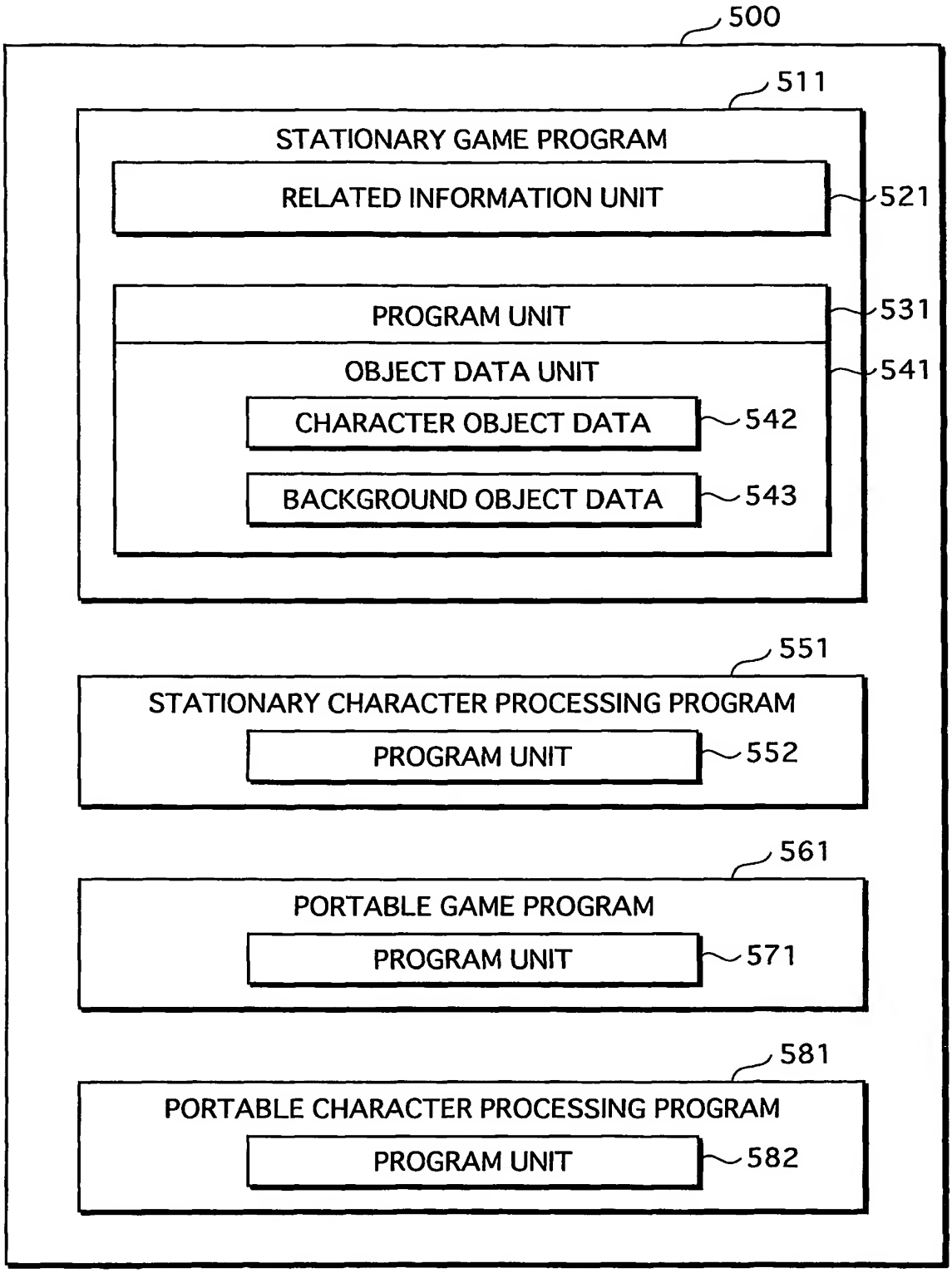

500
511
STATIONARY GAME PROGRAM
RELATED INFORMATION UNIT
521
PROGRAM UNIT
531
OBJECT DATA UNIT
541
CHARACTER OBJECT DATA
542
BACKGROUND OBJECT DATA
543
551
STATIONARY CHARACTER PROCESSING PROGRAM
PROGRAM UNIT
552
561
PORTABLE GAME PROGRAM
PROGRAM UNIT
571
581
PORTABLE CHARACTER PROCESSING PROGRAM
PROGRAM UNIT
582

FIG.3

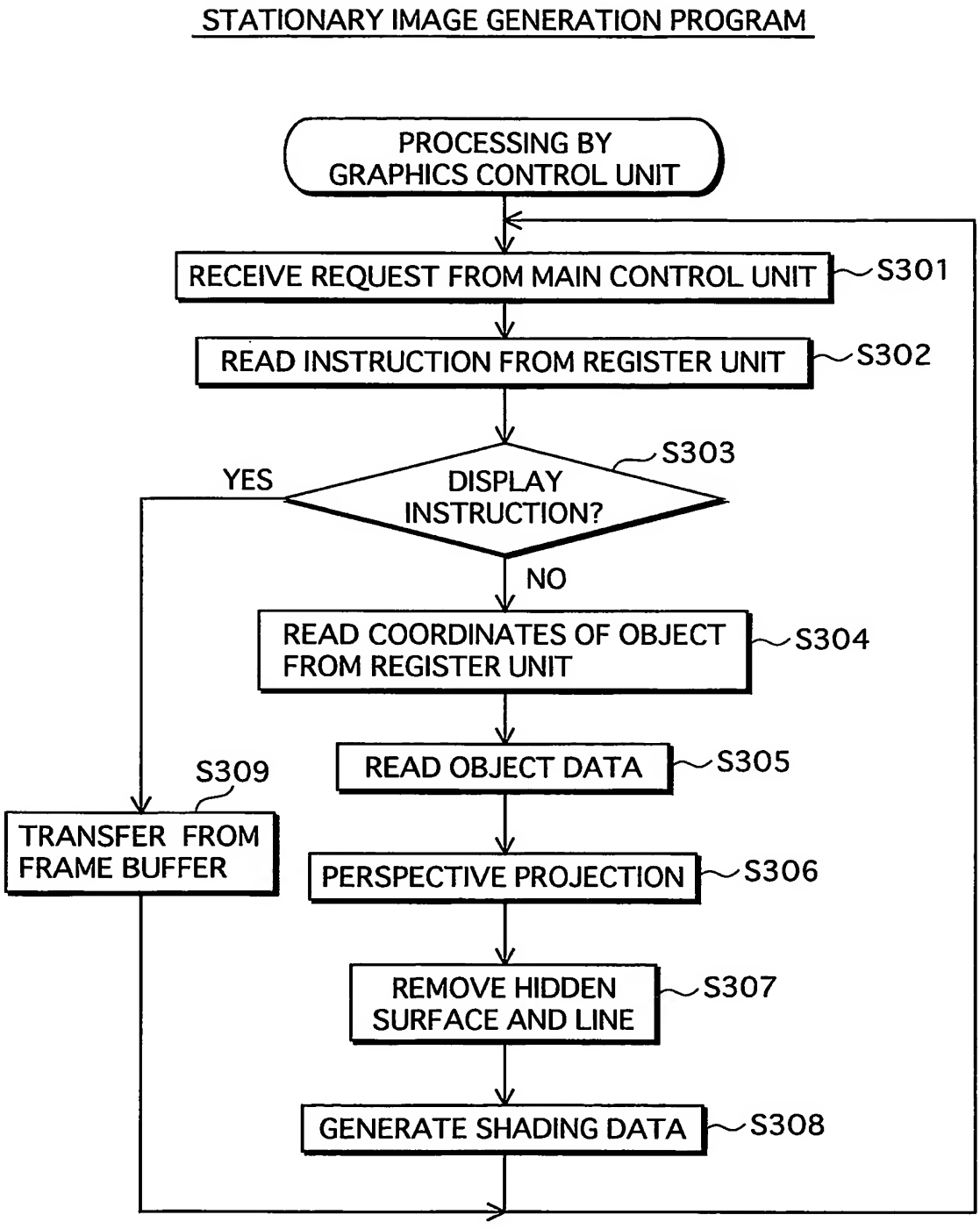

STATIONARY IMAGE GENERATION PROGRAM
PROCESSING BY GRAPHICS CONTROL UNIT
RECEIVE REQUEST FROM MAIN CONTROL UNIT
S301
READ INSTRUCTION FROM REGISTER UNIT
S302
DISPLAY INSTRUCTION?
S303
YES
NO
READ COORDINATES OF OBJECT FROM REGISTER UNIT
S304
READ OBJECT DATA
S305
PERSPECTIVE PROJECTION
S306
REMOVE HIDDEN SURFACE AND LINE
S307
GENERATE SHADING DATA
S308
S309
TRANSFER FROM FRAME BUFFER

FIG.4

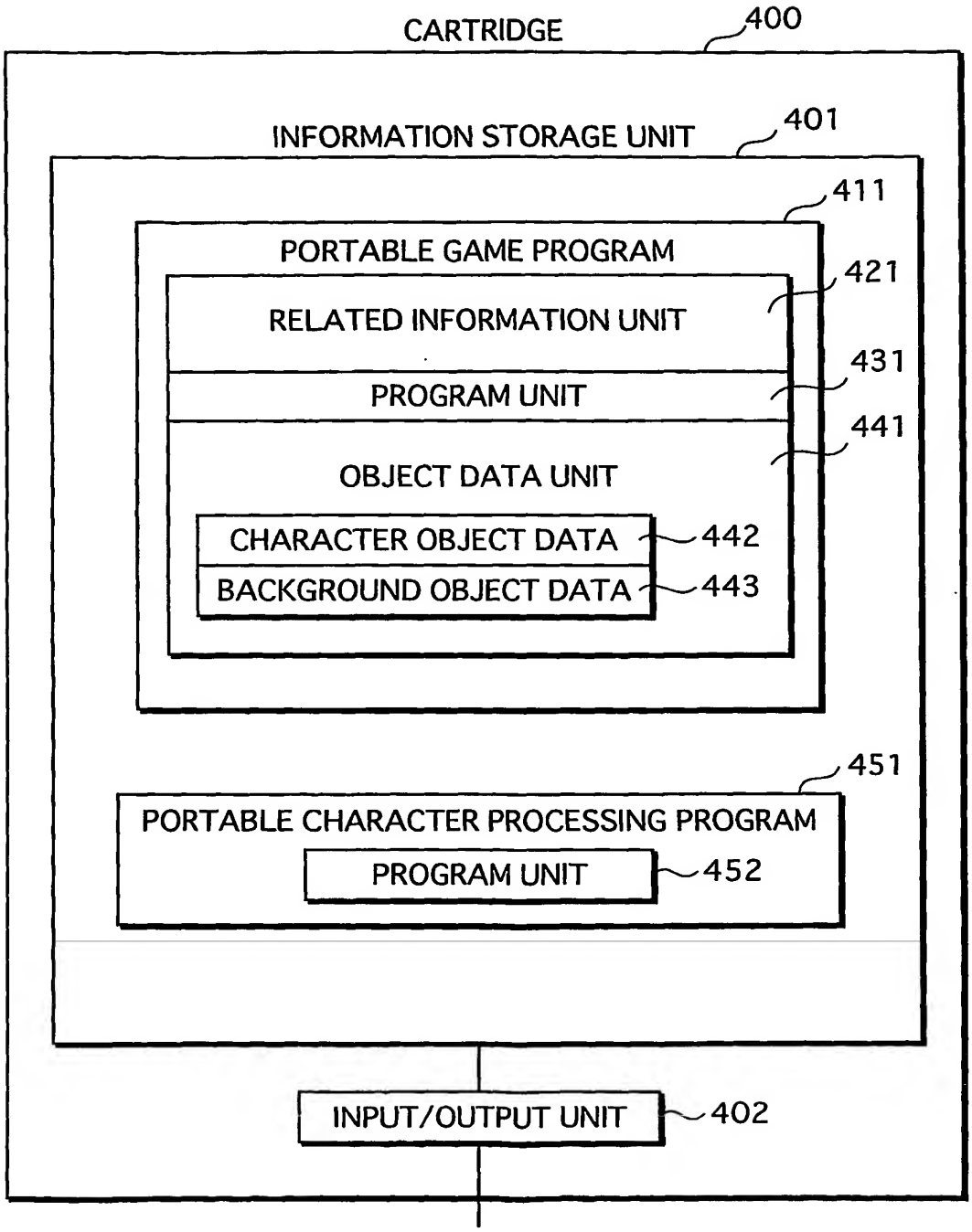

CARTRIDGE
400
INFORMATION STORAGE UNIT
401
411
PORTABLE GAME PROGRAM
421
RELATED INFORMATION UNIT
431
PROGRAM UNIT
441
OBJECT DATA UNIT
CHARACTER OBJECT DATA
442
BACKGROUND OBJECT DATA
443
451
PORTABLE CHARACTER PROCESSING PROGRAM
PROGRAM UNIT
452
INPUT/OUTPUT UNIT
402

FIG.5

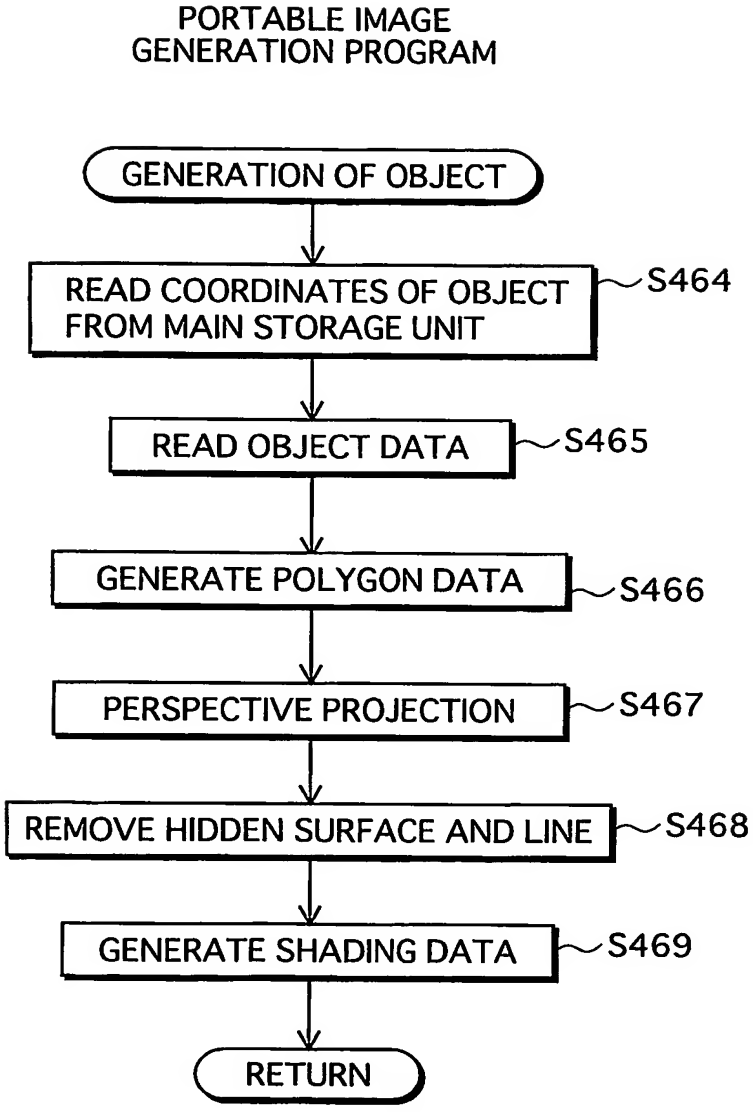

PORTABLE IMAGE GENERATION PROGRAM
GENERATION OF OBJECT
READ COORDINATES OF OBJECT FROM MAIN STORAGE UNIT
S464
READ OBJECT DATA
S465
GENERATE POLYGON DATA
S466
PERSPECTIVE PROJECTION
S467
REMOVE HIDDEN SURFACE AND LINE
S468
GENERATE SHADING DATA
S469
RETURN

FIG.6

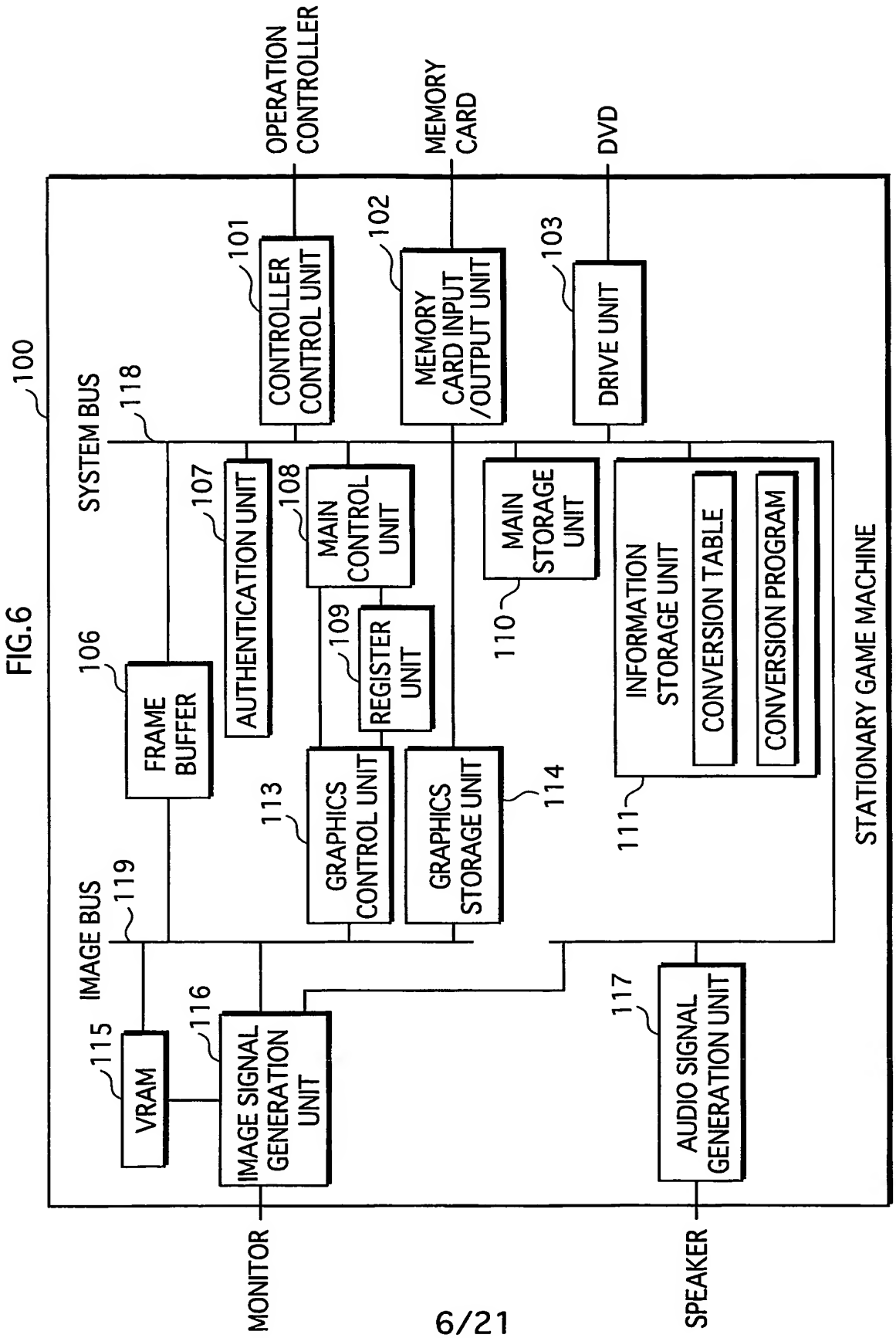

100
OPERATION CONTROLLER
MEMORY CARD
DVD
101
CONTROLLER CONTROL UNIT
102
MEMORY CARD INPUT /OUTPUT UNIT
103
DRIVE UNIT
SYSTEM BUS
118
107
AUTHENTICATION UNIT
108
MAIN CONTROL UNIT
MAIN STORAGE UNIT
110
INFORMATION STORAGE UNIT
CONVERSION TABLE
CONVERSION PROGRAM
111
106
FRAME BUFFER
109
REGISTER UNIT
113
GRAPHICS CONTROL UNIT
GRAPHICS STORAGE UNIT
114
STATIONARY GAME MACHINE
IMAGE BUS
119
115
VRAM
116
IMAGE SIGNAL GENERATION UNIT
117
AUDIO SIGNAL GENERATION UNIT
MONITOR
SPEAKER

FIG.7

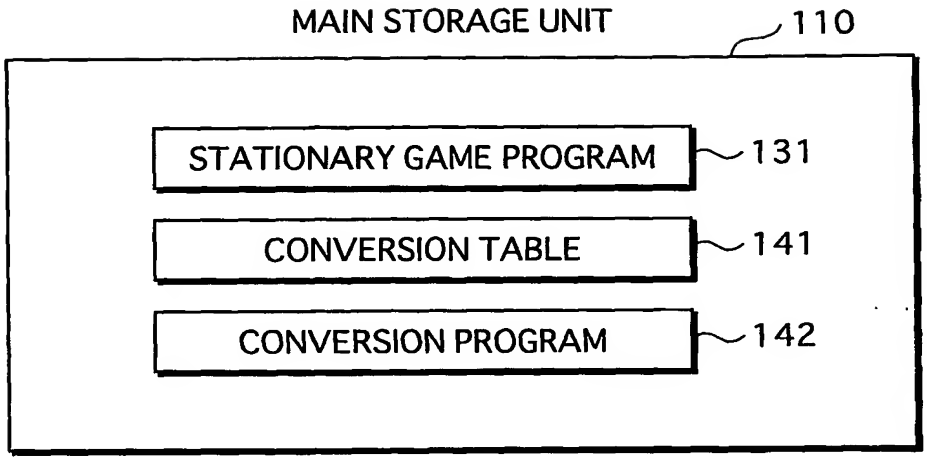

MAIN STORAGE UNIT
110
STATIONARY GAME PROGRAM
131
CONVERSION TABLE
141
CONVERSION PROGRAM
142

FIG.8

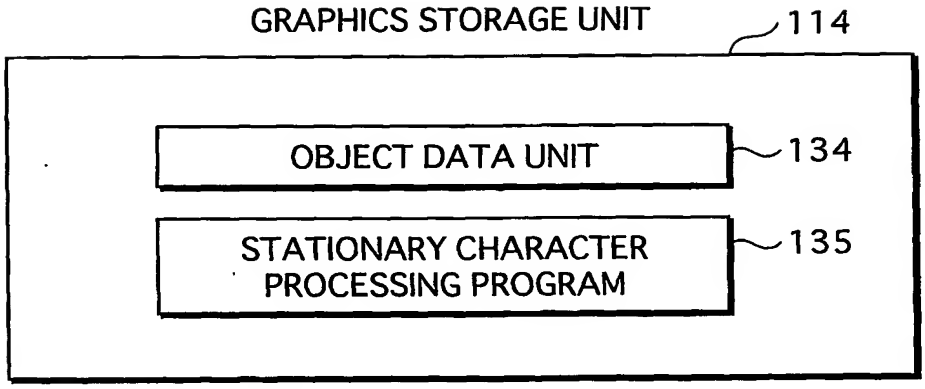

GRAPHICS STORAGE UNIT
114
OBJECT DATA UNIT
134
STATIONARY CHARACTER PROCESSING PROGRAM
135

FIG.9

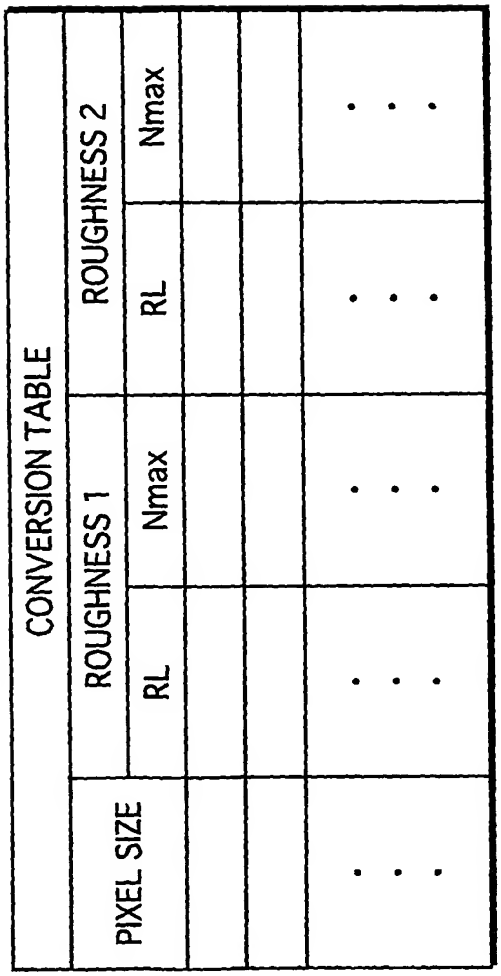

CONVERSION TABLE
PIXEL SIZE
ROUGHNESS 1
RL
Nmax
ROUGHNESS 2
RL
Nmax

FIG.10C

FIG.10B

FIG.10A

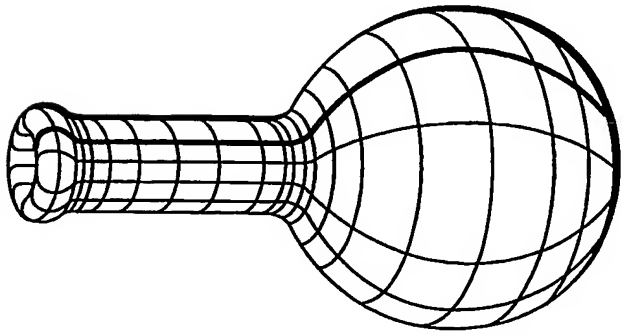


FIG.11

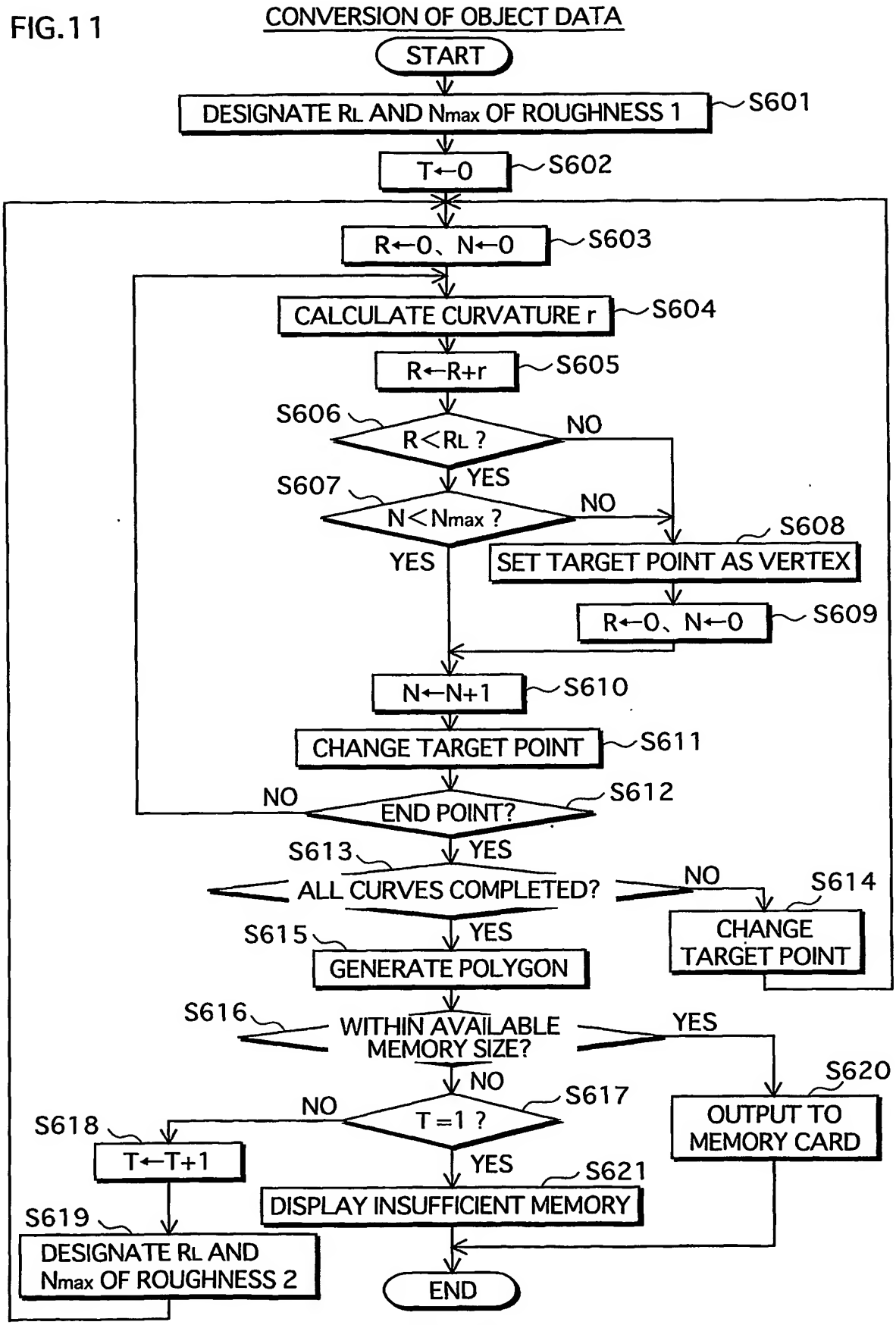

CONVERSION OF OBJECT DATA
START
DESIGNATE RL AND Nmax OF ROUGHNESS 1
S601
T←0
S602
R←0、N←0
S603
CALCULATE CURVATURE r
S604
R←R+r
S605
S606
R<RL ?
NO
YES
S607
N<Nmax ?
NO
YES
S608
SET TARGET POINT AS VERTEX
R←0、N←0
S609
N←N+1
S610
CHANGE TARGET POINT
S611
NO
END POINT?
S612
YES
S613
ALL CURVES COMPLETED?
NO
S614
CHANGE TARGET POINT
YES
S615
GENERATE POLYGON
S616
WITHIN AVAILABLE MEMORY SIZE?
YES
NO
S620
OUTPUT TO MEMORY CARD
NO
S617
T=1 ?
S618
T←T+1
YES
S621
DISPLAY INSUFFICIENT MEMORY
S619
DESIGNATE RL AND Nmax OF ROUGHNESS 2
END

FIG.12

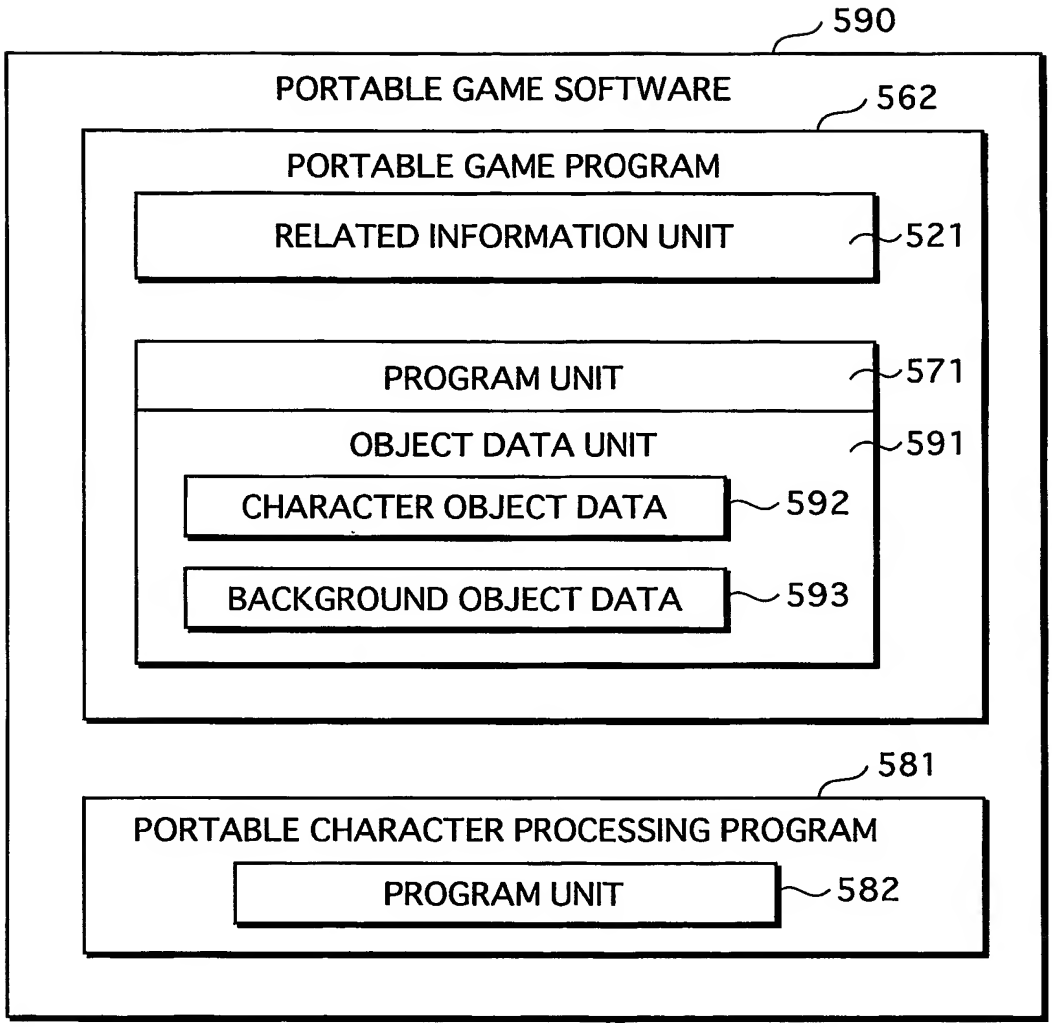

590
PORTABLE GAME SOFTWARE
562
PORTABLE GAME PROGRAM
RELATED INFORMATION UNIT
521
PROGRAM UNIT
571
OBJECT DATA UNIT
591
CHARACTER OBJECT DATA
592
BACKGROUND OBJECT DATA
593
581
PORTABLE CHARACTER PROCESSING PROGRAM
PROGRAM UNIT
582

FIG.13

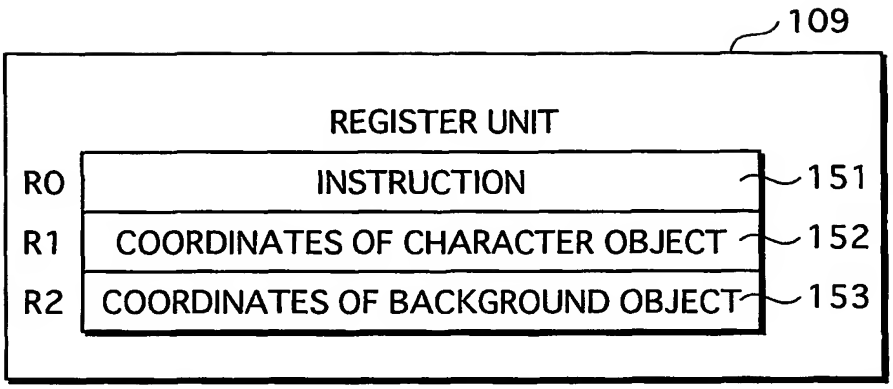

109
REGISTER UNIT
R0
INSTRUCTION
151
R1
COORDINATES OF CHARACTER OBJECT
152
R2
COORDINATES OF BACKGROUND OBJECT
153

FIG.14

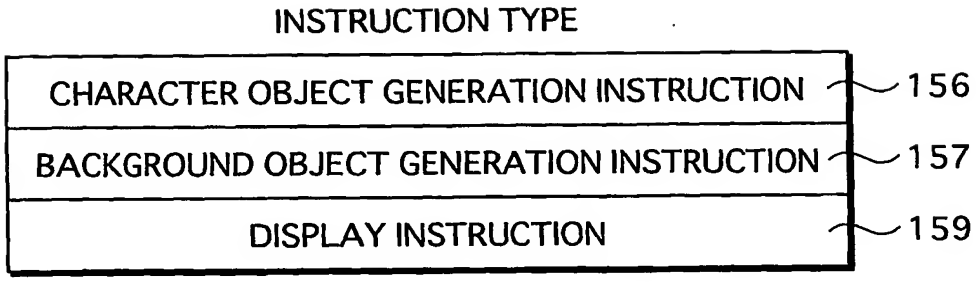

INSTRUCTION TYPE
CHARACTER OBJECT GENERATION INSTRUCTION
156
BACKGROUND OBJECT GENERATION INSTRUCTION
157
DISPLAY INSTRUCTION
159

FIG.15

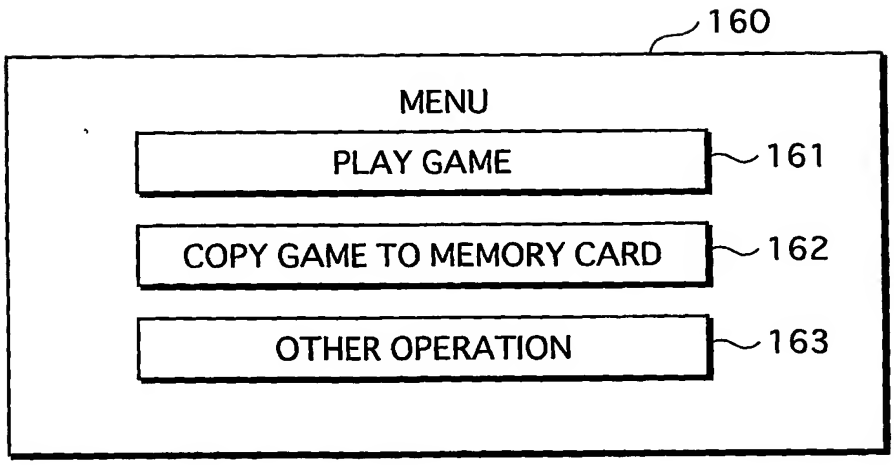

160
MENU
PLAY GAME
161
COPY GAME TO MEMORY CARD
162
OTHER OPERATION
163

FIG.16

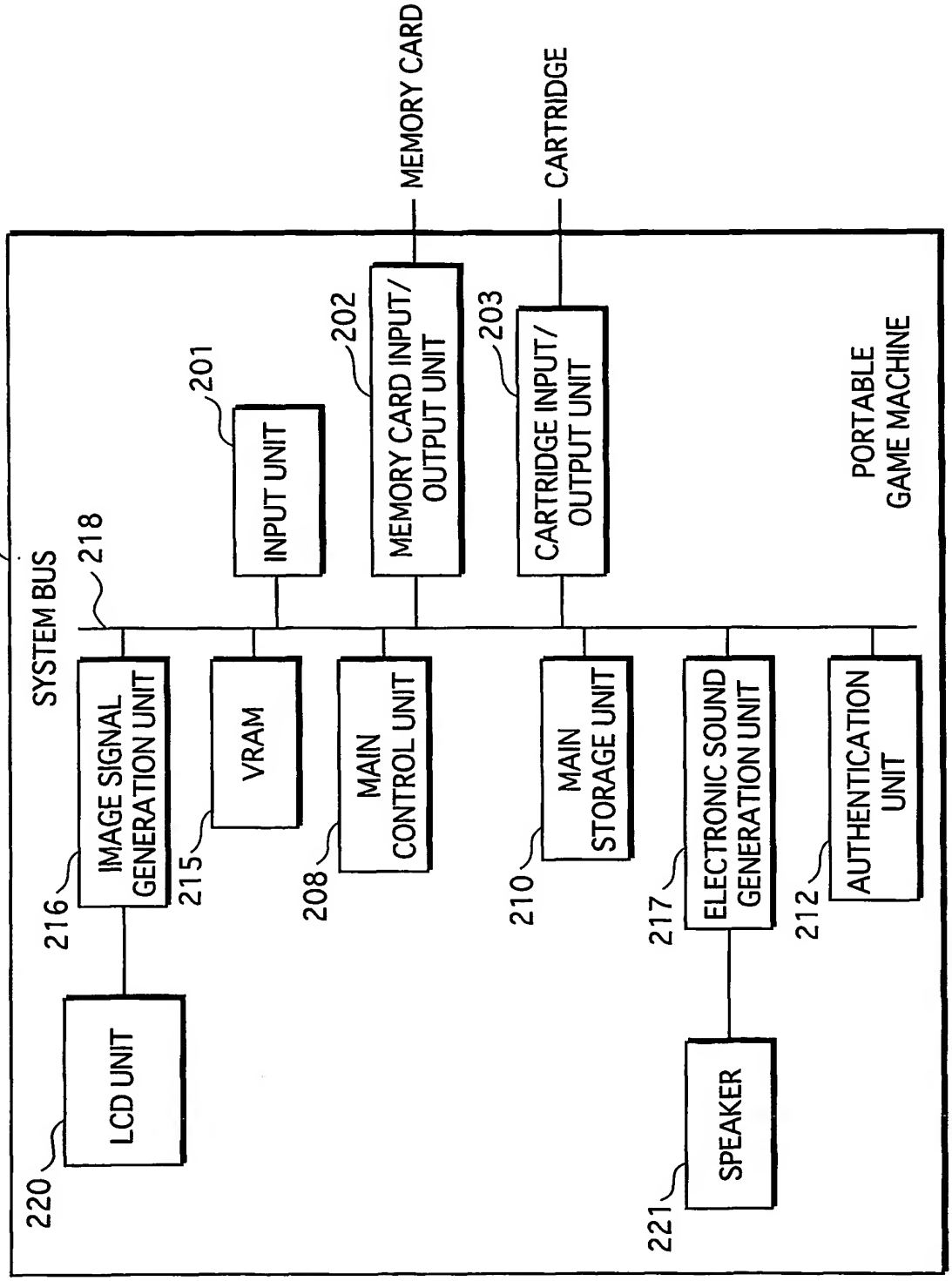

200
SYSTEM BUS
218
MEMORY CARD
CARTRIDGE
PORTABLE GAME MACHINE
201
INPUT UNIT
202
MEMORY CARD INPUT/ OUTPUT UNIT
203
CARTRIDGE INPUT/ OUTPUT UNIT
IMAGE SIGNAL GENERATION UNIT
216
LCD UNIT
220
VRAM
215
MAIN CONTROL UNIT
208
MAIN STORAGE UNIT
210
ELECTRONIC SOUND GENERATION UNIT
217
SPEAKER
221
AUTHENTICATION UNIT
212

FIG.17

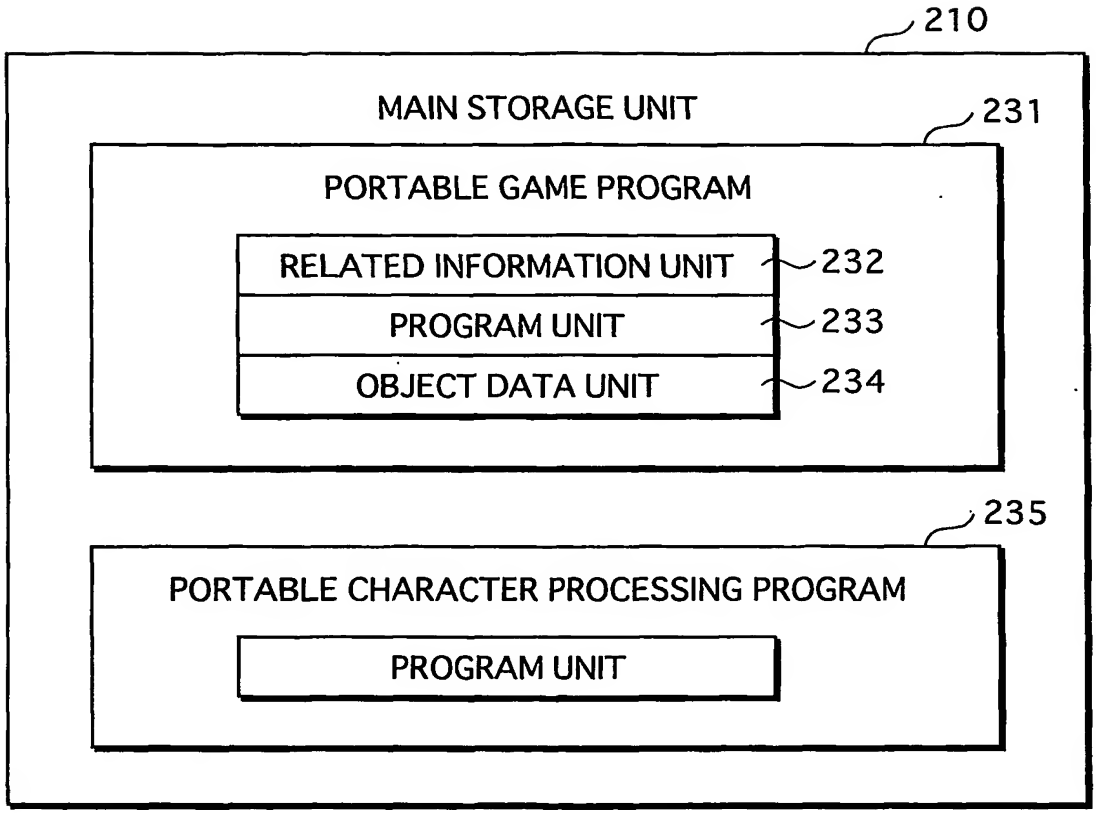

210
MAIN STORAGE UNIT
231
PORTABLE GAME PROGRAM
RELATED INFORMATION UNIT
232
PROGRAM UNIT
233
OBJECT DATA UNIT
234
235
PORTABLE CHARACTER PROCESSING PROGRAM
PROGRAM UNIT

FIG.18

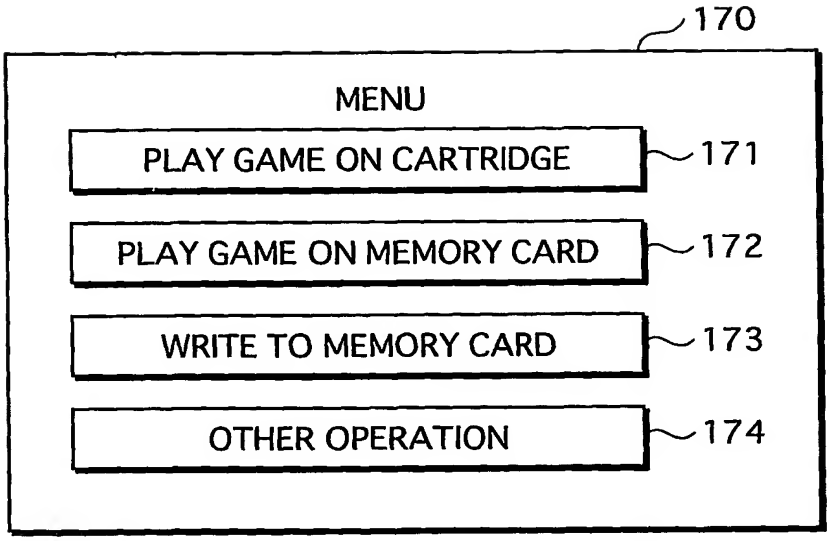

170
MENU
PLAY GAME ON CARTRIDGE
171
PLAY GAME ON MEMORY CARD
172
WRITE TO MEMORY CARD
173
OTHER OPERATION
174

FIG.19

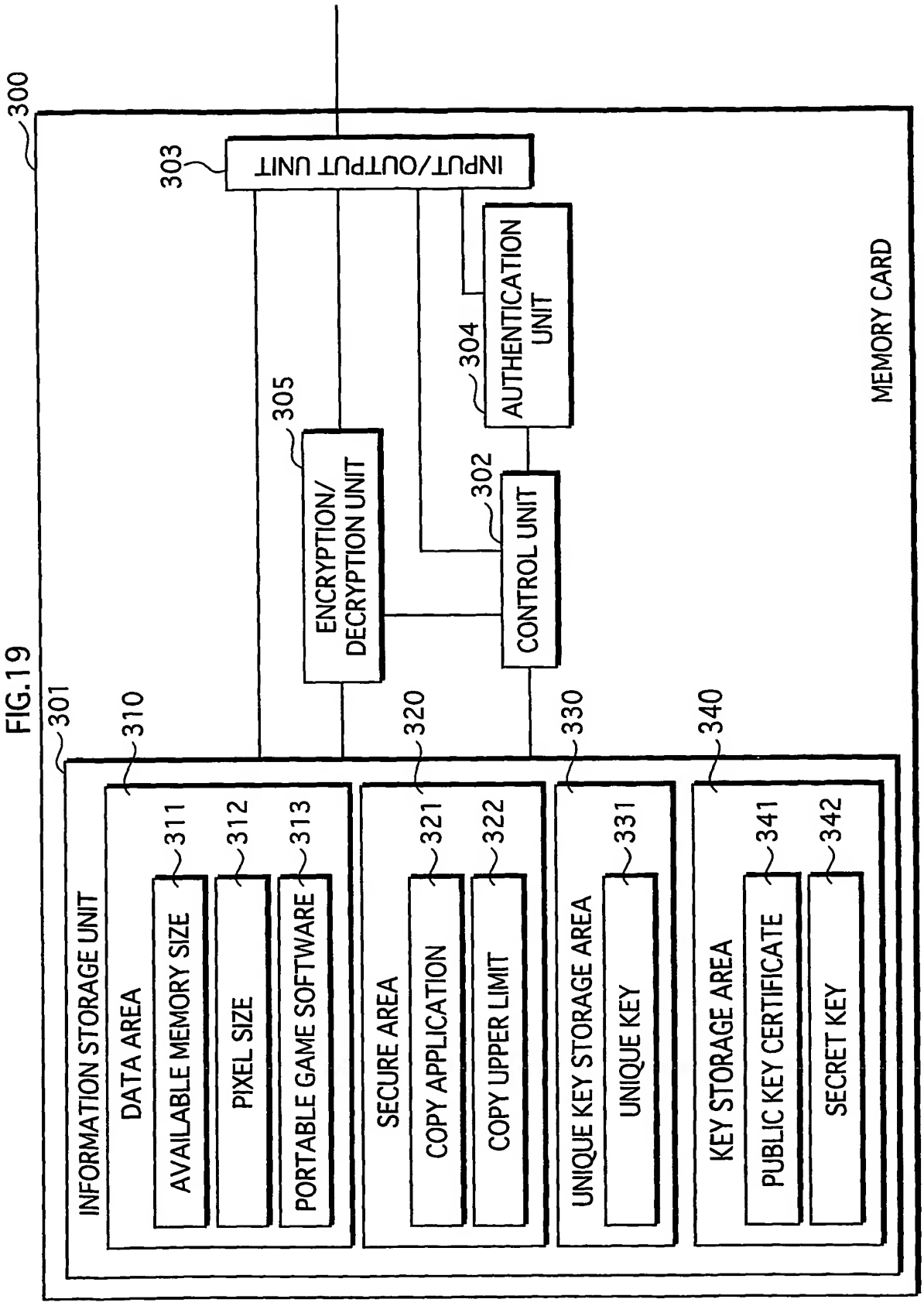
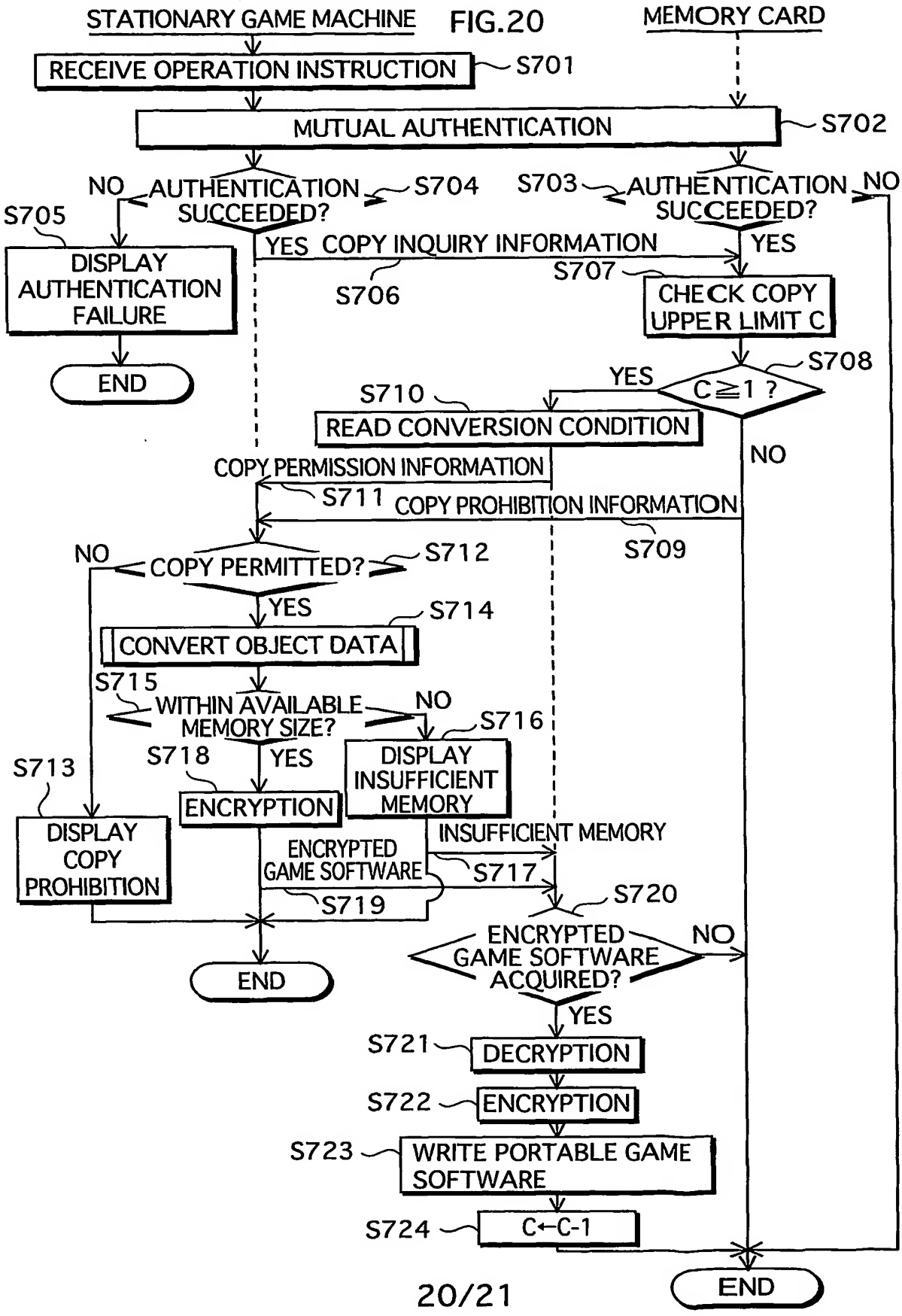

300
MEMORY CARD
303
INPUT/OUTPUT UNIT
304
AUTHENTICATION UNIT
305
ENCRYPTION/ DECRYPTION UNIT
302
CONTROL UNIT
301
INFORMATION STORAGE UNIT
310
DATA AREA
311
AVAILABLE MEMORY SIZE
312
PIXEL SIZE
313
PORTABLE GAME SOFTWARE
320
SECURE AREA
321
COPY APPLICATION
322
COPY UPPER LIMIT
330
UNIQUE KEY STORAGE AREA
331
UNIQUE KEY
340
KEY STORAGE AREA
341
PUBLIC KEY CERTIFICATE
342
SECRET KEY

FIG.20


STATIONARY GAME MACHINE
MEMORY CARD
RECEIVE OPERATION INSTRUCTION
S701
MUTUAL AUTHENTICATION
S702
NO
AUTHENTICATION SUCCEEDED?
S704
S703
AUTHENTICATION SUCCEEDED?
NO
S705
DISPLAY AUTHENTICATION FAILURE
END
YES
COPY INQUIRY INFORMATION
S706
YES
S707
CHECK COPY UPPER LIMIT C
S708
YES
C≧1 ?
S710
READ CONVERSION CONDITION
NO
COPY PERMISSION INFORMATION
S711
COPY PROHIBITION INFORMATION
S709
NO
COPY PERMITTED?
S712
YES
S714
CONVERT OBJECT DATA
S715
WITHIN AVAILABLE MEMORY SIZE?
NO
S716
DISPLAY INSUFFICIENT MEMORY
S718
YES
S713
ENCRYPTION
DISPLAY COPY PROHIBITION
INSUFFICIENT MEMORY
ENCRYPTED GAME SOFTWARE
S717
S719
S720
END
ENCRYPTED GAME SOFTWARE ACQUIRED?
NO
YES
S721
DECRYPTION
S722
ENCRYPTION
S723
WRITE PORTABLE GAME SOFTWARE
S724
C←C-1
END

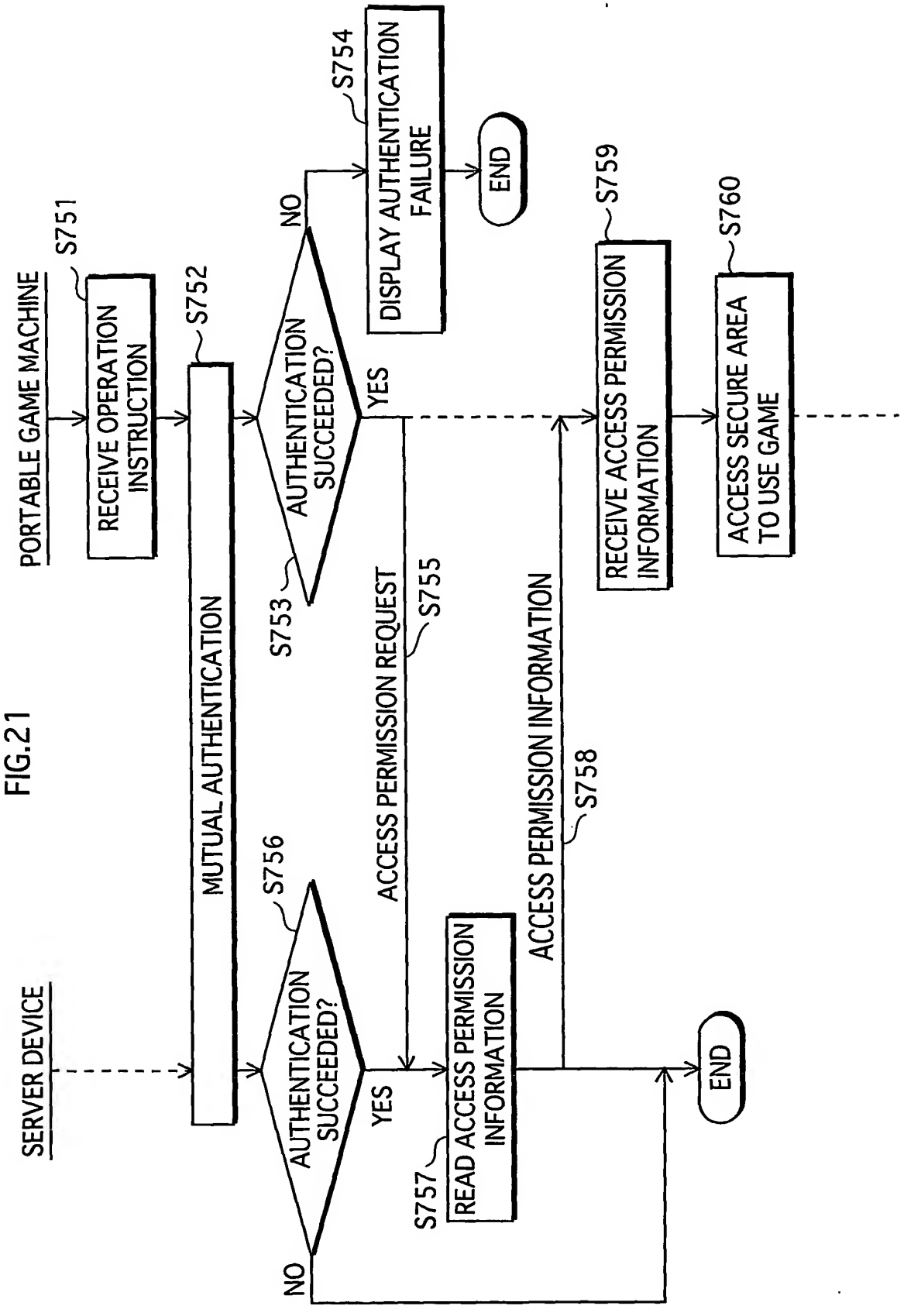

PORTABLE GAME MACHINE
SERVER DEVICE
S751
RECEIVE OPERATION INSTRUCTION
S752
MUTUAL AUTHENTICATION
S753
AUTHENTICATION SUCCEEDED?
NO
YES
S754
DISPLAY AUTHENTICATION FAILURE
END
ACCESS PERMISSION REQUEST
S755
S756
AUTHENTICATION SUCCEEDED?
NO
YES
S757
READ ACCESS PERMISSION INFORMATION
ACCESS PERMISSION INFORMATION
S758
END
S759
RECEIVE ACCESS PERMISSION INFORMATION
S760
ACCESS SECURE AREA TO USE GAME

FIG.21